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MISSOURI RIVER BASIN INVESTIGATIONS

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LAND PLANNING AND CLASSIFICATION REPORT
as Relates to the Public Domain Lands
in the
GRAND RIVER BASIN
NORTH DAKOTA
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TABLE OF CONTENTS

Page

ACKNOWLEDGEMENTS I
PURPOSE AND SCOPE II
SUMMARY III
GENERAL DESCRIPTION 1
  Location and Size 1
  Physiography, Topography and General Geology 1
  Climate 2
  Vegetative Cover 3
  Soils 4
  Land Classification 5
ECONOMIC AND SOCIAL FACTORS 7
  Cultural Development 7
  Area Economy 8
  Land Utilization Project South Dakota--21 10-A
  Indian Reservations 10-A
  Forest Lands 11
  Land Ownership 11
THE PUBLIC LANDS 12
  Description 12
RECOMMENDATIONS 15

Description of Land Use Capability Classes Appendix A

Description of Typical Soils of the Grand River Basin Appendix B

Figure I - Map of the Grand River Basin showing the Public Land and Related Programs Appendix C

ACKNOWLEDGMENTS

The general information in this report is largely a recompilation of information which has been assembled from numerous and varied sources. The detail data relating to the specific classification of the public domain lands was gathered by actual field examination.

Sources of information include records of the Bureau of Reclamation, Region VI, where information regarding the proposed and existing irrigation developments in the Grand River Basin was obtained. Data on land status, ownership, leases and location, as relates to the public domain lands, were obtained from the records of the various counties and the Bureau of Land Management (District Land Office, Branch of Field Examination, Public Survey Office). Information dealing with the land use economy of the area was obtained from records and personnel of the offices of the local Production and Marketing Administration, Soil Conservation Service, the county extension agents, and from agricultural statistics prepared by the U. S. Department of Commerce. The State Land and Water Boards furnished information regarding the acreages and location of state-owned lands and water facilities. The Office of the State Geological Survey, particularly in South Dakota, furnished valuable information on physiography, topography and geology relating to the area. Data on soils was gathered from various publications by the State Colleges in cooperation with the Bureau of Chemistry and Soils of the U. S. Department of Agriculture.

The field examinations and surveys were made by L. A. Merryfield, Range Examiner, Bureau of Land Management, who also assembled most of the data and prepared a major part of the report. Mr. R. D. Nielson, Land Economist, assisted in the report preparation and in its final edition.

PURPOSE AND SCOPE

The purpose of this report is to present, in a general way, the suitabilities and capabilities of the public domain lands remaining in the Grand River Watershed, particularly as their use relates to the comprehensive development of the resources of the Missouri River Basin. It is the objective of the Bureau of Land Management to classify all such lands to determine their highest use and potentialities under properly integrated uses, such as grazing, irrigated agriculture, dry land farming, forestry, recreation and wild life. From these findings will develop a program for the administration and management, or disposition of the remaining public domain lands in this area.

The scope of the report includes the area within the Grand River basin. The watershed was used as a basis of delineating the project area, although, after a study of the public lands, it was found that no critical watershed problems involving public domain lands existed. Only the public domain lands were studied in detail. Information on the general land use economy was obtained from published and unpublished reports.

Due to the relatively small percentage of public lands in this drainage, the overall influence of the use of these lands on the economy of the area will be small. However, the local adjustments, where acreages of public domain lands are significant, may be material. This report does not go into detail on the specific classifications of each individual tract, but this information has been secured and is available in the records of the Bureau of Land Management, Region III.

SUMMARY

The Grand River drainage lies between the drainages of the Moreau River in South Dakota and the Cannonball River in North Dakota and contains 5,750 square miles, seventeen percent of which is in North Dakota and eighty-three percent in South Dakota. The main tributaries to the Grand River are: the North Fork and Spring Creek in North Dakota; South Fork, Antelope and Bull Creeks in South Dakota.

The topography is level to rolling with no very important changes in relief and range from an altitude of 1,550 feet where the Grand River empties into the Missouri to 3,450 feet, the highest point of the Slim Buttes. This indicates a fall of 1,900 feet, or an average of 4.7 feet per mile. The most pronounced physiographic features are the Slim Buttes, Cave Hills, Table Butte, Lodgepole Butte and Thunder Butte. This area is in the Cretaceous table lands of the Central Great Plains Region. The surface rises by a series of steps and broad terraces from the Missouri River in the Dakotas to the Montana line. The dominant geological formations are the Fort Union (sand shale and clay); the Ludlow (sand and shales); the Fox Hills and Hell Creek (sandstones), and the Cannonball (sands and clay which also contains admixtures of lime).

There is little physiographic deterioration in the area because of the relatively level to rolling topography, the slow movement of streams and the excellent vegetative cover. The only places where deterioration is noticeable is on the scattered buttes in Perkins and Harding Counties; here there is a slow decomposition of the clay buttes and their sandstone caps which leave a white sandy deposit at their base.

The Grand River area is typically a plains country and is about the geographical center of North America, and is near the path of cyclones and anti-cyclones; has the extremes of summer heat and winter cold, together with rapid fluctuations in temperature characteristic of the continental climate. The area lies west of the 100th meridian and is in the semi-arid region where crop returns are uncertain on the unirrigated lands. The rainfall varies from a low of 11.67 inches to a high of 16.97 inches, 76% of which falls during the growing season. The minimum temperature is minus forty-six degrees and the maximum temperature is 115 degrees. The average length of the growing season is 129.5 days and the average frost-free period is from May 16 to September 24.

Most of the area supports a shortgrass type of vegetation and the principal species are blue grama, niggerwool and western wheatgrass, with green sage scattered through the area and big sage and valley sage are found along the drainages. There are 16,098 acres of public domain, all of which is grass land and has a carrying capacity of 7,230 animal unit months, or an average of 2.23 acres per animal unit month.

The soils belong to the Williams, Morton, Bainville and similar associated soil series which occupy the prairie lands of this section of the Dakotas The Williams soil is developed over calcareous till; the Morton and Bainville are developed under shale and sandstones, In some of the lands in south Bowman County, there is evidence of the Rhodes complex loams which is manifested in the slick spots along the North Fork of the Grand River.

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The largest towns in the area are Lemmon, with a population of 1,781 and Hettinger, with 1,138. The total population of the area is 16,163, or slightly less than three persons per square mile. The area is served by the Chicago, Milwaukee and St. Paul Railroad, which runs through the northern part of the area in an easterly and westerly direction. U. S. Highways numbered 12 and 212 cross east and west and Numbers 79 and 85 cross north and south; these are connected with adequate and well maintained State and County roads.

Nearly all of the crops raised are raised on dry farms, however, there are a few small private irrigation projects. The summarized report of the Reclamation Service shows that there are 66,000 acres of land in the Grand River Basin adapted to irrigation, but the full regulation of the water supply will permit the development of only 28,500 acres. Water will be provided by the construction of the Shadehill and Bluehorse Reservoirs and will be distributed by gravity canals and pumping stations. About seventy-five percent of the lands in the area is used for the grazing of livestock and, in cold snowy winters, there is a shortage of winter feeds; this will be alleviated by the additional acreages of irrigated hay lands when the present Reclamation plans have materialized and the construction completed on the projects now approved. This will help to stabilize the livestock industry and increase the production of animal products.

There are 16,098 acres of public domain lands in this basin which is less than one-half of one percent of the total area. All of the public domain lands are classified as grazing lands. The largest block is in the southern part of Bowman County, North Dakota and contains 3,280 acres of excellent grazing lands. This tract was withdrawn for reclamation purposes and is at the site of the proposed Bowman Reservoir. The withdrawal has recently been vacated, but the interest for the project remains strong among the local residents. Until the future of this project is settled, the lands should remain in public ownership.

In Perkins County, South Dakota there are 2,098 acres of public domain lands, 1,544 acres of which are in the Perkins County Land Utilization project. Their use for grazing purposes is administered by the Soil Conservation Service. They should remain in public ownership until a definite public land policy for the disposition or management of all public lands, including the repurchased lands, is determined. The remaining 554 acres in Perkins County are widely scattered isolated tracts primarily valuable for grazing. They should be offered into public sale or disposed of by some other means.

The 10,720 acres of public domain lands in Harding County are all grazing in character. They are isolated and are difficult to efficiently administer. They should be offered into public sale.

A - GENERAL DESCRIPTION

LOCATION AND SIZE

The Grand River Basin lies between the Moreau River Drainage of South Dakota and the Cannonball River in North Dakota in the northwestern part of South Dakota and the southwestern corner of North Dakota between 45° 20' and 46° 10' north latitude and between 100° 40' and 103° 40' west longitude. It includes parts of Bowman, Adams and Sioux Counties in North Dakota and Perkins, Ziebach, Dewey, Corson and Harding Counties in South Dakota.

The Grand River flows for approximately 95 miles in a southeasterly direction from its source near Bowman, North Dakota to the west boundary of Harding County, South Dakota and then continues in an easterly direction for another 75 miles, whence it empties into the Missouri River a few miles north of Mobridge, South Dakota. The widest part of this drainage is found in the west end where the south fork heads near Camp Cook, South Dakota and the north fork heads near Bowman, North Dakota. At this point the Drainage Basin is 55 miles wide. The confluence of the north and south forks with Flat Creek occurs near Seine in Perkins County, South Dakota and forms the Grand River. From this point to where it empties into the Missouri River the basin averages 35 to 45 miles in width. The Grand River Drainage Basin contains about 5,750 square miles.

PHYSIOGRAPHY, TOPOGRAPHY AND GENERAL GEOLOGY

About seventeen percent of the Grand River Drainage is in North Dakota and most of this is on the north fork in Bowman County; however, there are a few townships of privately-owned land on Oak and Rock Creeks in Sioux County. The topography of this area is level to rolling with no outstanding changes in relief. It ranges in elevation from 2,400 feet along the North Dakota boundary to 3,150 feet at the head of the north fork in Bowman County.

About eighty-three percent of the drainage is in South Dakota. The topography here is level to rolling with some rather pronounced physiographic features, such as Slim Buttes, Cave Hills, Table Butte and Lodge Pole Buttes in Harding County and Thunder Butte in Perkins County. The elevation ranges from 1,550 feet where the Grand River empties into the Missouri to 3,450, the highest point of the Slim Buttes, which indicates a fall of 1,900 feet for the total distance of approximately 170 miles which this river falls, or a fall of eleven feet per mile.

This area is characterized by the cretaceous table lands of the Great Central Plains region. The surface rises by a series of steps or broad terraces from the Missouri River to the Montana line. The edge of each terrace is fringed with flat-topped buttes, each capped with sandstone. In fact, it is the sandstone that causes the terraces, each step being the result of a sandy rock blanket left during the withdrawal of the cretaceous sea from South Dakota. These broad terraces and flat-topped buttes suggest the name "table land" to distinguish the country. This region covers all of the state north of the divide between the Moreau and

Cheyenne Rivers and extends into North Dakota to the divide between the Grand and the Little Missouri River. These buttes are the result of erosion of soft rock beneath a resistant cap. Streams and wind wear away the less resistant sub stratum, while the more resistant cap prevents erosion of the top. Where resistant sandstone alternates with soft sands and clay we find ideal conditions for butte formation which prevails in Harding, Perkins and Carson Counties in South Dakota and Bowman County, North Dakota.

At the edge of the region the Fox Hills sandstone overlies the gumbo-forming shales of the Pierre formation, causing a belt of large and small buttes with Fox Hills caprock to fringe the uplands from near the North Dakota line to Timber Lake in Corson County and west to the Slim Butte county of the Lower Grand River valley. The large buttes appear to wear their sandstone caps sedately square, but many of the smaller ones are tipped crazily at various angles.

The most picturesque and largest buttes in the state are in Harding County. These are the Cave Hills, East and West Short Pine Hills and the Slim Buttes. The Cave Hills were so named because of a large cave in the northern one which was explored by Captain Ludlow of the Custer Expedition in 1874. These are usually cliffs thirty to fifty feet high, capped with red or salmon colored sandstone. The Cave Hills are nearly twelve miles long by three miles wide and lie near the northern boundary of Harding County at the head of Bull, Jones and Nasty Creeks, which forms the head waters of the south fork of the Grand River.

The Slim Buttes rise as a long narrow barrier running north and south for nearly thirty miles. In most places they are less than a mile wide and the head waters of many of the steep coulees at their sides threaten to cut the buttes in two. The gleaming white caps of the Slim Buttes are white stream-made muds and sands which at one time covered the entire region, but have since been entirely removed, save for these remnants left by the eroding streams. These buttes rise 600 feet above the surrounding plains. This, combined with their length, would make them a formidable barrier for travel, were it not for two gaps which allow passage through them. The northern gap is known as the Reva Gap and is used by the main highway through the region. Towards the southern end of the ridge is another gap known as the J. B. Gap, from the old J. B. Ranch.

The dominant geological formations which cover the area considered in this report are the Fort Union sand, shale and clays; the Ludlow sand and shales; the Fox Hills and Hell Creek sandstones; and the Cannonball sand and clay, which also has admixtures of lime. It is from this parent material that the various soil types are formed.

CLIMATE

The Grand River area is typically a plains country varying from nearly level to low hilly ridges and is about the geographical center of North America. It is, therfore, near the paths of cyclones and anti-cyclones and has the extremes of summer heat and winter cold, together with rapid fluctuations in temperature characteristic of the continental climate.

This area lies west of the one hundredth meridian and is in the semi-arid region where the crop returns during the dry years may be very poor over the entire area; however, in relatively wet years good crops may be general. Heavy snow storms, blizzards and prolonged cold spells during the winter months make it imperative to provide shelter for livestock and to keep sufficient supplementary feeds on hand to tide them over during these emergency periods.

Table #1
Climatic Records as Shown at All Stations in the Area

Station	Yrs. Operated	Temperatures		Growing Season			Precipitation		Location
		Max.	Min.	Last Spring Frost	First Fall Frost	Days	Growing Season Inches	Total Annual Inches	
Bowman	24	112	-43	5/16	9/22	129	10.54	15.53	NW corner
Hettinger	37	115	-47	5/21	9/19	121	10.59	14.98	NE corner
Stowers	26	-	-	-	-	-	10.92	14.86	NE corner
Ft. Yates	24	119	-50	5/10	9/19	122	10.83	15.29	Extreme NE
Camp Cook	42	114	-57	5/19	9/20	125	10.61	14.16	West end
Ludlow	21	115	-37	5/12	9/26	137	10.01	12.53	SW central
Redig	29	116	-46	5/16	9/24	131	9.99	13.01	SW corner
Reva	31	115	-48	5/15	9/22	132	9.77	11.67	South boundary
Bison	23	113	-38	5/21	9/26	126	10.86	14.09	South central
Lemmon	33	116	-45	5/14	9/28	136	11.02	14.67	Central
Meadow	21	109	-41	5/20	9/29	131	12.16	15.99	South central
McIntosh	25	115	-58	5/12	9/25	132	12.94	16.97	North central
McLaughlin	21	116	-45	5/14	9/26	132	11.41	15.56	NE
Average 13	27	115	-46	5/16	9/24	129.5	10.897	14.632	

VEGETATIVE COVER

This entire area is characterized by the short grass type, the principal species being blue grama (Bouteloua gracilis), niggerwood (Carex filifolia), western wheatgrass (Agropyron smithii), slender wheatgrass (Agropyron pauciflorum), Junegrass (Koleria cristata), Kentucky bluegrass (Poa pratensis), three-awn (Aristida longiseta), sandgrass (Calamovilfa longifolia), redgrass (Andropogon scoparius). In some sections there is considerable green sage (Artemisia discolor) reaching as high as twenty percent of the composition in small isolated areas. There are no sagebrush types in this area; however, fringed sage (Artemisia frigidia), cudweed sage (Artemisia gnaphalodes), valley sage (Artemisia cana) and big sage (Artemisia tridentata) are scattered throughout the area, usually along intermittent and permanent streams and in broad coulees.

Table #2
Acreage, Vegetative Cover and Grazing Capacity of Public Domain Lands in the Grand River Basin.

County	Acres Public Domain	Grassland Acres (Type 1)	Grazing Capacity AUMs	Acres per AUM (2)
Bowman	3,280	3,280	1,526	2.15
Harding	10,720	10,720	5,000	2.17
Perkins (1)	2,098	2,098	704	2.85
	16,098	16,098	7,230	2.23

(1) Includes 1,544 acres with 554 AUMs in the Perkins County Land Use Unit.

(2) AUM - animal unit month or feed for one cow or one horse or 5 sheep for a period of one month.

The average grazing capacity of the privately owned range lands is somewhat higher than that of the public lands, requiring but 1.31 acres per animal unit month according to surveys made by the Department of Agriculture.

SOILS (See Appendix "A" for description of soil types)

The Williams, Morton, Bainville and similar and associated soils occupy the prairie lands of this area. The greater part of the surface is made up of broad undulating or gently rolling lands broken by valleys with gentle to steep slopes.

The Morton soils which cover most of the Grand River Basin are derived from the Fort Union, Ludlow, Cannonball, Hell Creek and Fox Hills formations. The soils derived from the Pierre, Niobrara, Carlile, Greenhorn and Granerous formations usually contain selenite and are often quite toxic, whereas the Morton soils are either free from selenite or have a much lower toxicity.

At the close of the cretaceous age or of some early part of the teritary age, the Pierre formations were covered over by the Fox Hills formations. Then, before the White River formations were deposited, the Laramie and Fox Hills formations were eroded away so that the White River formations rest directly on the Pierre shale. The White River formations are quite readily eroded and have exposed considerable Pierre shales, which is an important selenium bearer.

The Williams soils are developed over calcereous glacial till. The Morton and the Bainville soils are developed over shales and sandstone. This is evidenced on the 3,280 acre tract of public domain in T. 129 N., R. 101 W., Bowman County, North Dakota, where the parent formations are

the Ludlow sandstones, shales and clay, and the Cannonball sandstones, shales and limestone, both members of the upper crataceous age. The soils of this area probably belong to the Bainville-Rhodes loams, rolling phase. The rolling relief, ranging from five to fifteen percent gradient results in a less uniform distribution of "clay-pan spots", inasmuch as these spots most commonly occur in the depressions where drainage has not been adequate to carry off the excess sodium to which the claypan or solonetz development is largely attributed. This is most evident in the heavy clay bottom lands along Spring Creek and the north fork of the Grand River. This soil produces an excellent crop of native forage with an average density of four-tenths and an average grazing capacity of 2.15 acres per animal unit month. The adjacent privately owned lands are farming-grazing and, except during dry years, produce fair crops of wheat, oats, field corn and hay.

The only other block of Public Domain of over 160 acres is found in T. 18 N., R. 2, 3 and 4 E., Harding County, South Dakota. The soil on these tracts is of light sandy texture and probably belongs to the Flasher loamy fine sand, hilly phase and the Bainville loam hilly phase, all of the Morton series. It has a sharply rolling or hilly surface with slopes ranging from five to thirty percent. The brown surface soil varies from that of typically loamy fine sand. It is very thin or entirely lacking on the steep parts of many slopes. This soil type is adapted only for grazing and should be carefully managed, since it is subject to both wind and water erosion if the vegetation is unduly disturbed. The vegetation is comprised mainly of blue grama (Bouteloua gracilis). and niggerwool (Carex filifolia). Dense patches of sandgrass (Calamovilfa longifolia) are common on the slopes and edges of the tables. Due to favorable climatic conditions and low utilization, fifty to seventy-five percent, the area is well-covered with native vegetation and old gully erosion scars are well healed. The average vegetative density is 3/10 and the average carrying capacity is 3.5 acres per animal unit months. The parent formations of this soil type are the Hell Creek and Fox Hills formations of the upper crataceous age; therefore, we have light sandy soil on the ridges with sandy clay loams in the coulees and along the south fork of the Grand River. The other scattered tracts of public domain in Harding County are much the same soil type, since they are derived from the same formations.

There are 554 acres of public domain in scattered forties in Perkins County, South Dakota. All are of the same soil type with the Ludlow formation of sandstones, shales and clay as the parent materials. The soils of these isolated forties are a brown sandy clay loam, top soil one to three inches deep and a lighter sub-soil six to thirty-six inches deep.

LAND CLASSIFICATION (See Appendix "B" for description of land use capability classes)

The Federal lands of this project area are primarily valuable only for the grazing of livestock because of climatic factors, soil types, topography and distance to market. Table #3 shows the classification of these Federal lands into range types and capability classes; it also shows the lands that are under grazing lease and those that are vacant. 4,128 acres have been placed in capability class #4 even though it is believed that none of this land should be used for limited cultivation, but that it is best suited for permanent vegetation because the topography is rolling and

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those small areas along streams such as Spring Creek and the Grand River are poorly drained. Large boulders are prominent on some tracts and the lands would be vulnerable to wind and water erosion if disturbed. However, there is an average of six to ten inches of top soil, and six to forty inches of sub-soil. 7,753 acres have been placed in Class 5 because of topography and surface characteristics, such as undulatory ridges and coulees close together, rock outer fringes, and occasionally a small Fox Hills pinnacle. However, the area is well-sodded with palatable native grasses, and has a carrying capacity of less than three acres per AUM. 2,673 acres are placed in Class 6 because the slopes may be up to twenty percent and much of it is rocky and hummocky with more numerous Fox Hills pinnacles and some small sandstone cliffs. However, the carrying capacity is fair to good, ranging from three to ten acres per AUM. This land would be more subject to wind and water erosion if the vegetative cover were unduly disturbed. The entire area is in excellent condition because of favorable climatic conditions and proper use for the past several years.

Table #3
Present Use and Capability of Public Domain
Lands in the Grand River Basin.

County	Leased	Vacant	Grazing	Capability Classes (See Appendix "B")		
			Type 1	4	5	6
Bowman	3,280	- - -	3,280	2,100	1,180	- - -
Harding	8,478	2,242	10,720	1,997	6,253	2,470
Perkins	80	474	554	31	320	203
Total	11,838	2,716	14,554	4,128	7,753	2,673

In Perkins County a Land Use Unit was set up by the Soil Conservation Service and all the "submarginal" lands were purchased under the Bankhead-Jones Act. The following table shows the acreage distribution and use of these lands by numbered pastures at the present time, according to the records of the Soil Conservation Service.

Table #3A

Pasture Number	Public Domain Range Lands		Other Than Public Domain					
	Acres	AUMs	Acres Range Lands	AUMs	Acres Idle Rotated	Acres Cultivated	Acres Crested Wheatgrass	Total Acres
1	368	145	4,620	2,100	2,933	258	149	8,328
2	80	21	8,194	3,582	2,377	253	- -	10,904
3	160	38	14,842	6,956	3,333	1962	202	20,499
4	40	8	8,898	4,267	1,324	90	208	10,560
5	280	83	9,894	4,277	4,707	723	458	16,062
6	40	14	20,016	7,140	2,209	766	299	23,330
7	40	19	3,674	1,371	2,671	215	- -	6,600
8	136	63	10,516	3,925	2,218	158	- -	13,028
9	400	143	16,058	3,687	1,871	52	- -	18,381
	1,544	534	96,712	37,304	23,643	4,477	1,316	127,692

Public Domain range lands average 2.9 acres per animal unit month.
Other range lands average 2.6 acres per animal unit month.

The Federal lands in T. 129 N., R. 101 W., comprising 3,280 acres, were withdrawn from entry by executive order dated October 20, 1906, first form reclamation withdrawal under Section 3 of the Act June 17, 1902. This order was revoked by executive order dated September 28, 1945 and the lands restored to entry. The Bowman Reservoir, which would have inundated this tract of land, was to have been built on the north fork of the Grand River above Haley, North Dakota and, while it has attracted much attention for many years, it intercepts a relatively small drainage with a low run-off and it was estimated by the Reclamation Bureau that only 3,800 acres could be adequately supplied by the reservoir and the cost would be prohibitive. This project was therefore eliminated from plans for basin-wide development under the reclamation program. Of this tract, 2,100 acres have been placed in capability class 4 as being more valuable for permanent vegetation than for any other use. The top soil is six to eight inches thick, of good texture and color; and the sub-soil is from six to forty inches thick and porous, except for those lands along Spring Creek and the north fork of the Grand River. The foothills are too rough and rocky for cultivation and the lowlands too poorly drained. The entire tract is in excellent condition, well sodded with a good cover of palatable native grasses which show a utilization of only fifty to seventy-five percent. All old erosion scars are well healed.

B - ECONOMIC AND SOCIAL FACTORS

CULTURAL DEVELOPMENT

Practically the entire population is supported by farming and ranching. There is no other industry in the area except a few small coal mines which work 25 to 40 men during the winter months.

Due to the low rainfall (under 15" per year) and the long cold winters, the agriculture and grazing resources of this area can support only a limited population. The populations of the towns are shown in the following list:

Adams & Bowman Counties, N.D.	3,860
Bowman (County Seat)	960
Buffalo Springs	66
Gascoyne	48
Reeder	263
Buckrus	117
Hettinger	1,138
Haynes	167
Haley	12
	2,771
Corson County, S. Dak.	6,755
McIntosh (County Seat)	626
Watagua	133
Thunder Hawk	100
Grand Valley	8
Athboy	13
Gopher	13
Cadillac	5
McLaughlin	660
Mahto	55
	1,612

Dewey County, S. Dak.	5,709
Timber Lake	
Harding County, S. Dak.	3,013
Buffalo (County Seat)	400
Ludlow	4
Ralph	17
	421
Perkins County, S. Dak.	6,585
Bison (County Seat)	310
Lemmon	1,781
Ellingson	7
White Butte	85
Lodge Pole	34
Cash	37
Meadow	60
	2,314
Ziebach County, S. Dak	2,875
Glad Valley	5
Total population in towns	7,123
Total population on farms	8,990
Total population of area	16,163

These tables show that there are slightly less than 4 persons per square mile over the entire study area. However, a heavier concentration is found along the railroad and in the farming areas of Corson County. Corson County shows an average of 4.8 persons per square mile while the balance of the area shows an average population of 2.1 persons per square mile.

Bowman, Hettinger, McIntosh, McLaughlin and several smaller towns are located along the Chicago, Milwaukee and St. Paul Railroad and serve the areas adjacent both as shipping points and shopping centers. Most of the livestock raised in Harding and Perkins Counties, South Dakota, are shipped from Belle Fourche, South Dakota, one of the largest cattle shipping points in the United States.

This area is served by the Chicago, Milwaukee and St. Paul Railroad, which runs through the northern part in an east-west direction and is the main line of the railroad from Chicago to the west coast. Transcontinental telephone and telegraph lines cross the area along the railroad, and most of the towns are connected up with the Bell system. Local telephone connections are afforded by privately-owned lines which reach most of the farms and ranches. Rural electrification covers most of the farming areas in Corson, Bowman and Perkins Counties and additional lines are being planned for the more outlying settlements. All the towns and ninety-five percent of the farms and ranches which do not have commercial electrical connections have their own private plants.

U. S. Highways numbered 12 and 212 cross the area from east to west and U. S. Highways numbered 85 and 79 cross from north and south. State Highway No. 8, a good graveled road, runs from Mobridge, South Dakota through the center of the area to Buffalo and Camp Cook. State Highways numbered 6, 8, 16, 24, 31, 49, 63, 65 and 73 cross the area north and south. These are all well drained and graded roads with most of the mileage graveled. County roads connect all the farms, ranches and small settlements with the United States and State Highways. These roads are also well graded and drained.

There are excellent grade and high schools at Bowman, Hettinger, Reeder, Buffalo, Bison, Lemmon, McIntosh and McLaughlin and grade schools in all the smaller settlements.

AREA ECONOMY

The economic development of this area has probably reached its peak under present conditions. However, the bringing under irrigation of additional acreage would increase agriculture production and the rural population. There are also large beds of soft coal (lignite) in Harding and Perkins Counties which may be of great economic value in the future and provide the means of industrial development. During 1945, 26,872 tons of sub-bituminous or black lignite coal were produced in this project area, employing 41 men, and the product was valued at $76,500.00. 1/

There are ten small manufacturing plants within the area employing 24 persons and producing $102,099.00 worth of merchandise annually. These are

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1/ Mineral Yearbook, 1945 Publication: Bureau of Mines.

flour mills, creameries and sheet metal and building material plants employing from 1 to 4 men each. 1/

A study was made by the Department of Agriculture of 303 stock ranches in Harding, Perkins and Bowman Counties for the purpose of determining the average size of operation. The findings are indicated in Table 4.

Table #4
Size of Ranch Units

Unit Size of Ranch	No. of Units	Total No. Acres	No. AUM's	Average Acres Per Ranch	Average AUM's Per Ranch	Av. Acres Per AUM
Under 1,500 Acres	121	118,761	91,312	982	755	1.30
1,500 to 3,000	97	206,339	154,794	2,127	1,595	1.33
3,000 to 5,000	40	169,508	129,460	4,238	3,237	1.31
5,000 to 7,500	21	122,617	97,366	5,839	4,636	1.26
7,500 to 10,000	4	33,037	24,588	8,254	6,147	1.34
10,000 to 15,000	16	201,345	146,670	12,584	9,166	1.37
15,000 to 20,000	2	33,037	27,384	16,514	13,692	1.20
Over 20,000	2	56,886	48,780	28,443	24,390	1.16
	303	941,537	720,363	3,108	1,996 Weighted	1.31

The University of Wyoming and the University of Montana, as well as individual workers, have determined that a properly balanced economic livestock unit should be 200 cattle or 1,000 sheep, which would require 2,400 AUM's of feed for the yearlong operation.

While the above table shows this to be the average, 2,376 AUM's, to be exact, an analysis also shows that, of the 303 units, 218 are below this minimum standard and therefore, the operators must have a low standard of living or have other income.

The County Agents of Harding and Perkins Counties consider that an operator of a livestock unit should have between 4,000 and 5,000 acres of this type of land for a proper economic unit. This checks very closely with the foregoing determinations.

The Department of Agriculture Census shows that in 1945, there were 208,500 animal units of range and domestic livestock, cattle, horses and sheep in Bowman, Harding, Perkins and Corson Counties, which would require 2,502,000 animal units of feed for the yearlong operation. Compilation of

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1/ Rand McNally Commercial Atlas and Marketing Guide--1945.

range and pasture carrying capacities and other feeds used exclusively for livestock indicated that there are 2,800,000 animal unit months of feed available. This would indicate that the area is stocked to about 90% of the capacity.

In Harding and Perkins Counties, where there are large tracts of open range, range livestock may be run on the open range throughout the year, being fed baled hay, grain and concentrates only during the stormy and cold periods. However, the general practice throughout the area is to graze the stock on open range and summer pastures from the first of March to the last of October, depending on weather conditions. The cattle and sheep are moved to the farm pastures and feed lots when weather conditions demand, where they remain until the spring grazing season opens. Lambs are generally shipped to market in October and November. The cattle operators generally operate on a calf and yearling basis. About 50% of the operators sell their calves shortly after weaning, and the remainder hold them over one winter, selling them as long yearling feeders.

The milk cows and horses are kept in the farm pastures and feed lots all year, where they are readily available for use. The number of horses is rapidly declining as the farms and ranches become more mechanized.

Table #5 shows numbers of livestock and their distribution according to the 1945 census and information gathered in the field.

Table #5 1/

County	Cattle			Sheep			Horses			Hogs		
	No. Oper. Units	No.	Unit Av.	No. Oper. Units	No.	Unit Av.	No. Oper. Units	No.	Unit Av.	No. Oper. Units	No.	Unit Av.
Bowman	466	17,861	38	167	49,218	295	416	2,089	5	309	3,142	(10)
Harding	238	31,865	134	238	127,260	535	434	4,617	11	215	3,397	(16)
Perkins	867	39,324	45	276	113,947	413	276	6,607	24	467	5,143	(12)
Corson	728	35,889	49	92	27,841	303	716	6,626	9	442	6,568	(15)
	2,299	124,939	54	773	318,266	412	1,842	19,939	11	1,433	18,850	(13)

1/ 1945 Census of Agriculture figures, U. S. Department of Commerce.

Table #6 shows the production of oats, hay and corn.

Table #6

County	Wild and Tame Hay			Oats			Corn		
	Acres	Yield	Tons Per A.	Acres	Yield	Tons Per A.	Acres	Yield	Tons Per A.
Bowman, N.D.	43,498	36,047	.85	14,042	533,553	38	1,715	36,479	21.4
Harding	69,871	54,761	1.27	6,990	242,332	34.6	909	17,780	19.4
Perkins	104,839	89,282	1.11	15,248	512,604	33.6	10,861	19,383	17.8
Corson	65,966	59,178	1.11	18,432	633,377	34.4	17,269	307,795	17.8

Table #7
Merchantable Crops

County	Spring Wheat			Winter Wheat			Flax Seed			Alfalfa Seed		
	Acres	Bushels	Per A.	Acres	Bushels	Per A	Acres	Bushels	Per A.	A.	Bu.	PerA.
Bowman	99453	1359664	13.7	570	5472	9.6	2730	20676	7.6	19	16	.84
Harding	21658	290562	13.4	75	875	11.7	312	2240	7.2	35	50	1.42
Perkins	82366	1159123	14.1	1884	25755	13.7	1303	8633	6.6	5	6	1.2
Corson	112976	1490316	13.2	1255	14867	11.8	5412	32757	6.1	12	10	.83

Table #8
Farm Feed Crops

County	Potatoes			Rye			Barley		
	Acres	Bushels	Per A.	Acres	Bushels	Per A.	Acres	Bushels	Per A.
Bowman	140	12,711	90	678	9,501	14	24,333	606,352	25.
Harding	123	9,357	76	366	5,536	15	8,684	195,041	22.4
Perkins	129	5,533	66	967	10,458	11	19,896	417,703	21.
Corson	147	12,498	85	1,922	18,863	10	21,362	399,696	18.8

The major part of the farm lands are in Corson County and northeast Perkins County in South Dakota and in Bowman County, North Dakota. Harding County and the eastern part of Perkins County are devoted mainly to the production of livestock and livestock products. It will be noted in Table #7 that the production of merchandisable crops in Harding County is comparatively low.

Practically all of the crops raised in this area are raised on dry farms; however, there are a few small private irrigation projects in operation along the Grand River and some of its larger tributaries. The county and township boards estimate that there are about 650 acres of hay, crop and truck gardening lands under irrigation in the South Dakota part of this project area and about ninety acres in North Dakota.

The summarized report of the Reclamation Service shows that there are 66,000 acres of land in the Grand River Basin adapted to irrigation, but that full regulation of the water supply will permit the development of only 28,500 acres.

LAND UTILIZATION PROJECT SOUTH DAKOTA--21

This land utilization project is located in the south central part of Perkins County and the southwestern part of Corson County in South Dakota. (See map) Submarginal lands were purchased under the Bankhead-Jones Farm Tenant Act and retired from crop production. A part of this area has been subdivided into nine fenced pastures; each is provided with the necessary stock watering facilities. Table #3A of this report shows a detailed breakdown of the land use in each pasture. It will be noted that, up to the latter part of 1945, 1,316 acres had been reseeded to crested wheatgrass. This work is being continued each year, and it is expected that by the end of 1948, all the reverted lands will be reseeded. Use in each pasture is being rotated each year and records are being kept of the actual use being made of each one. The area is being used exclusively by cattle and horses.

The gross area of this project is 461,917 acres, of which 1,544 acres or .3% are public domain; 144,287 acres or 31% are acquired lands; 20,960 acres or 5% are state lands; 12,240 acres or 2.7% are county lands and 282,888 acres or 61% are county lands. Of this area, 412,328 acres lie in Perkins County and 49,589 in Corson County.

The Shadehill damsite is located within the boundary of this land utilization project in the S$\frac{1}{2}$S$\frac{1}{2}$ Sec. 25, T. 21 N., R. 15 E.; and when completely full, will inundate approximately 8,000 acres along the north and south fork of the Grand River and along Lodge Pole Creek. This dam will have a crest of 1,500 feet, 80 feet above the normal stream bed, and will impound 134,000 acre feet, and will afford irrigation for some 12,000 acres of irrigable lands extending 25 miles to the east on the north side of the river. 1/

INDIAN RESERVATIONS

All the lands in this project area lying in Corson, Ziebach and Dewey Counties are within the exterior boundaries of the Cheyenne and Standing Rock Indian Reservations. The gross acreage of this land is 1,670,740 acres; 130,910 acres or 8% are tribal lands; 78,852 acres or 5% are state lands; 1,460,978 acres or 88% are private lands. Of this area, 84% is pasture, grazing and waste, 4% is hay land and 12% is crop land. According to the 1945 census, this area had a livestock population of 125,000 cattle, 30,000 sheep, 7,000 horses and 7,000 hogs. For further detail on crop production, consult tables 4, 5, 6, 7 and 8 of this report.

The Blue Horse damsite is located on the Indian Reservation and will inundate about 4,000 acres of lands when completed and filled. This dam will provide irrigation water for 16,500 acres of lands in the Blue Horse service area. 1/ The Oahe Reservoir, when completed and filled, will back water up Oak Creek and the Grand River on the Standing Rock Indian Reservation in Corson County for about ten miles and inundate some 12,000 acres along these streams.

1/ From Bureau of Reclamation Reports.

FOREST LANDS

31,376 acres of the Custer National Forest in Harding County, South Dakota, are within this project area. This forest provides posts, poles, wood and some saw timber for the local residents, as well as providing recreational areas and wildlife protection. Some deer are found along the Grand River and in the sand hills at the head of the south fork. Some antelope are found on the open ranges of Harding and Perkins Counties. Prairie chickens, Chinese pheasants and a few sage hens are found scattered throughout the area. Ducks are numerous along the Grand River and its tributaries, especially on the north fork.

LAND OWNERSHIP (See Map, Appendix C, for location of Public Domain)

Table #9
Land Ownership by Counties

County	Public Domain Acres	Forest Reserve Acres	Tribal Lands Acres	Acquired Lands 1/ Acres	State Lands Acres	County Lands Acres	Private Lands Acres	Total
Bowman	3,280	- - -	- - -	- - -	24,960	3,946	365,494	397,680
Sioux	- - -	- - -	- - -	- - -	4,120	1,140	65,260	70,520
Adams	- - -	- - -	- - -	- - -	1,600	- - -	171,760	173,360
Harding	10,720	31,376	- - -	- - -	167,569	85,486	587,920	883,071
Perkins	2,098	- - -	- - -	111,229	67,252	29,940	714,821	907,671
Corson	- - -	- - -	130,138	33,058	76,452	- - -	1,409,410	1,616,000
Ziebach	- - -	- - -	370	- - -	1,440	- - -	29,670	31,480
Dewey	- - -	- - -	402	- - -	960	- - -	21,898	23,260
	16,098	31,376	130,910	144,287	344,353	120,512	3,366,233	4,103,042

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Table #10
Distribution of Land Ownership Classes by Counties in Percent

County	Public Domain	Forest Reserve	Indian	S.C.S.1/ Acquired	State	County	Private	Total
Bowman	.82	- - -	- - -	- - -	6.28	.99	91.91	100.00
Sioux	- - -	- - -	- - -	- - -	7.16	1.59	91.25	100.00
Harding	1.21	3.55	- - -	- - -	18.98	9.68	66.58	100.00
Perkins	.23	- - -	- - -	12.25	7.41	3.30	76.81	100.00
Corson	- - -	- - -	8.10	2.01	4.73	- - -	85.16	100.00
Ziebach	- - -	- - -	1.17	- - -	4.57	- - -	95.26	100.00
Dewey	- - -	- - -	1.62	- - -	4.13	- - -	94.25	100.00
Adams	- - -	- - -	- - -	- - -	.92	- - -	99.08	100.00
Total Area	.39	.77	2.29	3.52	8.39	2.93	81.71	100.00

1/ Land acquired by the Soil Conservation Service by purchase through the Bankhead-Jones Law and by exchange or withdrawal.

C - PUBLIC LANDS

DESCRIPTION

Of the total of 14,554 acres of public lands in this project area which are under the jurisdiction of the Bureau of Land Management, 11,838 acres are under grazing leases and 2,716 are vacant. There are no oil, gas, coal or mineral leases on public lands in the area.

A detailed classification has been made of each tract of public domain lands and descriptive information on each is in the files of the office of Region III of the Bureau of Land Management. A general description of the public land situation and recommended management follows.

The public lands are scattered throughout Bowman County, North Dakota and Harding and Perkins Counties, South Dakota. The largest tract, consisting of 3,280 acres, is found in Bowman County along Spring Creek and the North Fork of Grand River in Sections 11, 13, 14, 15, 23, 24, 25, 26 and 35, Township 129 N. Range 101 W. There is sufficient live, yearlong water in Spring Creek which passes through Sections 14, 15, 24 and 35 to water all the livestock that can be properly grazed on this tract. These lands are well sodded with palatable grasses, including blue grama (Bouteloa gracilis), niggerwool (Carex filifolia), western wheatgrass (Agropyron smithii), slender wheatgrass (Agropyron pauciflorum), saltgrass (Distichilis stricta), Junegrass (Koleria cristata) and others. The vegetation is composed of 90% grasses, 5% weeds and 5% shrubs. The average density is .4, and the average weighted palatability is .567 according to Western Range Survey standards. They produce a total of 1,526 animal uni' months of feed or an average of 2.15 acres per animal unit month annually.

This block of public domain is in the Ludlow and Cannonball geological formations and, therefore, the soils are sandy to sandy clay loam with some limestone where the Cannonball is present. The soil is light sandy clay loam along Spring Creek and the Grand River. The top soil is 2 to 8" thick, light to dark brown in Color and quite porous, except along the creeks where it becomes more compact. The sub-soil is from 6 to 48" thick and well-drained except on the flat lands along Spring Creek and the North Fork of the Grand River where it extends below the water level and is therefore continually saturated. The soils belong to the Bainville-Rhodes loams, rolling phase. This complex consists of Bainville loam in which are intermittent areas of Rhodes loam or in which the claypan characteristics of Rhodes loam are developed only to a slight degree, as along the slow-moving Spring Creek and Grand River. In comparison with Bainville loam, smooth phase, this Bainville complex is less productive of small grains, largely because of the rolling relief and the undesirable effect such relief has on soil development, moisture relationships, use of farm machinery and susceptibility to erosion. Soils of this complex are considered more valuable for the production of native vegetation and the grazing of livestock than for any other purpose. This tract of land was, at one time, first form reclamation withdrawal for the storage of water to be backed up by the construction of the Bowman storage reservoir project, but this project has

since been abandoned by the Reclamation Bureau. The residents of the area would very much like to have this project reconsidered and construction started. Investigations indicate that these lands would bring ten to fifteen dollars per acre if offered for sale and conditions of the adjacent privately-owned lands indicate that they would be so managed that their disposal would not detract from their value as watersheds or wildlife habitat. There is no forseeable future when they might be required for homesite leases or recreational areas.

In Harding County, South Dakota there are 10,720 acres of public domain in the Grand River drainage. The largest tracts being in Sections 12 and 13, Township 18 N., Range 2 E: and Sections 7, 8, 9, 13, 17, 18 and 35, Township 18 N., Range 3 E: Sections 2, 3, 4, 5, 6, 8, 10, 11, 32 and 33 in Township 18 N., Range 4 E., comprising 3,891 acres with a carrying capacity of 1,339 animal unit months or an average of 2.91 acres per animal unit month. These lands are located along the headwaters of the South Fork of the Grand River, Nasty Creek, Bull Creek, Jones Creek and Sand Creek and are rolling to steeply broken by sandstone cliffs, sandstone capped knobs, narrow, deep coulees, such as are generally found in the Fox Hills, Hell Creek, White River and Pierre formations. In many places the White River formation, which was laid down directly on the Pierre Shales has eroded away, exposing the Pierre shales.

The vegetative cover is the short grass type with an average of about ten percent weeds and shrubs and has an average density of .3 and an average weighted palatability of .568. The principal species are blue grama (Bouteloa gracilis), niggerwool (Carex filifolia), western wheatgrass (Agropyron smithii), slender wheatgrass (Agropyron pauciflorum), Poa, June grass (Koleria cristata), red grass (Andropogan scoparius) and three-awn (Aristida longisetta) and the most prominent shrubs are green sage (Artemesia discolor), cudweed sage (Artemesia gnaphalodes), valley sage (Artemesia cana), and fringed sage (Artemisia frigidia).

The soils are light sandy loams on the benches and ridges which merge into sandy clay loams along the Grand River and its tributaries. These soils are derived from the Fox Hills, Hell Creek, White River and Pierre formations. An extensive soil survey has not been made of this area, however, the texture, color and parent material indicate that it belongs to the 'Flasher loamy fine sand, hilly phase' and the Morton loam rolling phase. The top soil is from one to eight inches thick and is brown in color, becoming lighter in color with depth. The subsoil is from four to thirty-six inches in depth and is generally well drained. There are small areas of Morton-Rhodes loams along the drainages as indicated by the slick spots.

There is no yearlong stock water on these lands; however, there is sufficient water trapped in water holes and which seeps along the creeks to provide stock water most of the year. The geological formation and the experience of ranchers in the vicinity indicate that ample underground water is available at depths from forty to one hundred and fifty feet.

These lands are valuable only for the grazing of livestock, game habitat and watershed protection. Most of these lands are surrounded by state lands and an effective land exchange might be worked out that would be advantageous both to the state and the Federal governments.

At present price levels, these lands are worth from $1.25 to $5.00 per acre.

The remaining 6,829 acres of public domain in Harding County are scattered throughout twenty-seven townships and 107 isolated tracts of from forty to two hundred acres each. These are sixty-six forty-acre tracts, twenty-eight eighty-acre tracts, five 120-acre tracts, six 160-acre tracts and two 200-acre tracts. These tracts are in the same general geological formations, have the same vegetative types and the same general characteristics as those just described. They are level to rolling, with narrow deep coulees, sandstone capped knolls and sandstone outcroppings. The soils belong to the Morton loams rolling phase with a few small areas of Morton-Rhodes loams in low spots. There is no stock water on any of these tracts and the tracts are so small and scattered that it would be unsound economics to attempt to develop water facilities on each. The operator, within whose pasture they are generally located, provides sufficient stock water for their proper utilization. The only value these lands have, at the present time, is for the grazing of livestock. The tracts are so small that they would have little effect on watershed or erosion control. However, they do have a grazing value to the operators owning adjacent lands. The value is estimated at from one to five dollars per acre.

There are 554 acres of public lands outside the Land Utilization Project in Perkins County, South Dakota, which consist of isolated forties in Section 3, Township 16 N., Range 17 E: Section 15, Township 18 N., R. 17 E: Section 25, Township 19 N., R. 10 E: Section 30, Township 19 N., R. 11 E: Section 17, Township 19 N., R. 15 E: Sections 2 and 10, Township 19 N., Range 17 E: Sections 5 and 35, Township 20 N., R. 10 E: Section 25, Township 20 N., Range 11 E and Section 2, Township 21 N., Range 10 E. These are all isolated forties surrounded by privately owned lands, except one eighty, the S½ SW¼ Section 15, Township 18 N., R. 17 E., along Cool Creek. There are several veins of lignite coal on this eighty and probably the whole eighty is underlain with coal. All these lands are in the short grass region of the great plains and the dominant grasses are grama grass (Bouleloa gracilis), western wheatgrass (Agropyron smithii), slender wheatgrass (Agropyron pauciflorum), Junegrass (Koleria cristata) and bluegrass with an average density of .35 and an average carrying capacity of 2.9 acres per animal unit month. These tracts are in the Fox Hills, Hell Creek and Fort Union geological formations and, since this is the parent material, the soils are light to dark brown, light sandy to sandy clay loams of good texture and well drained. The top soil is light to dark brown and from two to ten inches in depth. The subsoil is from six to forty-eight inches in depth. These lands are more valuable for grazing of livestock than for any other use at this time and are classified as grazing lands.

There is no surface water on any of these tracts; however, ample underground water is found at depths ranging from 40 to 150 feet, but because of their small size and the distance between each, stock water developments by the Federal government cannot be justified. The operators in whose pastures these isolated tracts occur provide ample stock water for their proper use. There is a desire by part of these operators to acquire title to the lands which their private holdings surround and at present price levels, they would bring from $2.50 to $10.00 per acre.

All of the Federal lands in this project area have been well protected and properly used during the past several years and are in excellent condition. This is due at least in part to favorable moisture conditions for the past six years, the disappearance of trespass horses and the low stocking which is prevalent on most of the unit, however, the stockmen who were interviewed are very desirous of maintaining an excellent forage cover at all times.

There are no erosion problems on the Federal lands in this project area and no evidence of vegetative depletion. As a matter of fact, all the old erosion scars are rapidly healing over and there appears to be a gradual improvement in the vegetative composition and density. The 1936 range survey in Harding County showed a larger percent of green sage, fringed sage and weeds than are present now. There is, of course, the normal erosion which is caused by wind and weathering and is tending to level off the sand capped knobs and ridges in the Fox Hills, Hell Creek and White River formations. The streams move so slowly that little cutting can be expected from them. This, coupled with the excellent vegetative cover, makes it unlikely that any severe water erosion is likely to occur. However, due to the lightness of the soil, any undue disturbance by trailing of livestock, overgrazing or dry land farming might bring about serious wind erosion and dust storms.

RECOMMENDATIONS

Under the present land use economy the 16,098 acres of public lands in the Grand River basin are primarily valuable for grazing. Except for the block of 3,280 acres along North Fork, in Bowman County, these public lands consist of isolated tracts of legal subdivision, ranging mostly from "lots" of less than forty acres to 160 acres. They naturally are the least desirable lands in the area. They generally occupy sites of poor soils, rough topography, and low productivity.

In Harding County, where there is a total of 10,720 acres of public domain lands, 8,478 acres are leased for grazing purposes. The remaining 2,242 acres were not being legally used under any of the public land laws. The largest tract, containing 2,021 acres, is in T. 18 N., Rs. 3 and 4 E. These lands are completely surrounded by state owned lands and could advantageously be administered in conjunction therewith. They serve no useful public purpose except for grazing and it is recommended that they be disposed of, preference being given to the State in satisfaction of outstanding lieu land rights, if any. The remainder of the public domain lands in Harding County should be offered into public sale as they serve no useful public interest.

The public domain lands in Bowman County, consisting of 3,280 acres, all in one tract which is in the North Fork drainage in T. 129 N., R. 100 W. North Dakota. At one time this tract was embraced within a first form reclamation withdrawal when the area was to be involved in the construction and development of the Bowman Reservoir. The withdrawal was recently vacated however, when the watershed and storage cost proved the project impracticable. There is still hopes by many of the local residents that this project will be completed; they contend that it is a feasible project. It is recommended that these lands remain in public status until it is

definitely decided as to the feasibility of the Bowman Reservoir Project.

Only eighty acres of the 554 acres in Perkins County, which is outside the Land Utilization project, are leased. All of these lands consist of small isolated tracts, mostly "forties", very widely scattered. It is recommended that they be offered into public sale.

The 1,544 acres of public domain lands within the Land Utilization project in Perkins County are under the administrative jurisdiction of the Soil Conservation Service, Department of Agriculture. They are managed in conjunction with repurchased lands acquired under the resettlement program and the Bankhead-Jones Act. It is recommended that these public domain lands remain in public status until a definite public land policy for the disposition or management of all public lands in this Land Utilization project is determined.

APPENDIX "A"

Land Use Capability Classes (as referred to in the text)

Class IV:

Land suitable for limited cultivation under intensive conservation practices, but best suited for permanent vegetation. Class is characterized by topography ranging from flat, poorly drained areas to lands of slopes up to fifteen percent. The surface may be marked with numerous physical obstacles, such as large rocks, stumps, etc. The soil ranges from very light to very heavy in texture. On well-drained areas, land is highly vulnerable to erosion, particularly by water. It may have occasion to frequent gullies and severe sheet erosion. Intensive drainage may be necessary, but is seldom justifiable. Lands in this class are not suited for row crop production. Occasional cultivation for short periods is possible, but not desirable.

Class V:

Lands not suited for cultivation because of either poor drainage, obstacles or a permanent lack of an adequate water supply for cultivating purposes. It is suitable to permanent vegetation for grazing or woodland use, with no special restrictions. This class is characterized by topography which is flat or nearly so. Lands may be very stony or wet, which precludes cultivation. Soil texture ranges from light to heavy on well drained areas and has good permeability to twenty-four inches. Typical soil types are from loamy sand to friable clay. These lands are not subject to significant wind or water erosion. Drainage, if necessary, is not practicable but generally is not a problem. Good range and woodland management will maintain soils and resources in this class. Protection from fire is necessary. Depleted areas, due to abuse, may require reseeding. The area lends itself to rehabilitation practices of water spreading and reseeding.

Class VI:

Lands not suitable for cultivation, but suited to permanent vegetation for grazing and/or woodland use, but require moderate restrictions generally due to the vulnerability of the soil to erosion. The class is characterized by topography ranging from flat to slopes up to twenty percent. Surface may be rocky, stony or hummocky. The soil texture ranges from very light to very heavy, is shallow to moderately deep. Permeability may be excessive to poor. Soils are capable of producing vegetation but are subject to moderate erosion by wind and/or water. Special practices are required to maintain resources in this class under use. They include proper stocking and distribution, proper seasonal use and fire protection. Water conservation practices may be useful to increase production and reduce erosion. Depleted or deteriorated lands in this class may require severe restrictions in use and extensive rehabilitation practices to permit recovery.

APPENDIX "B"

Description of Typical Soils of the Grand River Basin (as referred to in the text) (from Soil Survey, McKenzie County, Department of Agriculture 1942)

The Williams Soil Series:

The Williams soil series includes the dark grayish-brown soil developed from olive.-drab gravelly clay till to the smooth to undulating uplands and terraces. The surface of the Williams loam is dark grayish-brown mellow loam or silt loam and is underlain by a layer of dark brown clay loam or sandy clay loam to a depth of approximately sixteen inches, which has a prismatic structure and when dug out falls apart in blocky prismatic fragments about the size of walnuts. The soil is one of the most uniform and one of the most desirable soils of the county and more than ninety percent of it is cultivated. This soil series is divided into two classes or types, i.e., the Williams Loam and the Williams Clay Loam. The value of the Williams soils for small grains and grazing lands is about eighty percent of that of the most desirable land in western South Dakota.

The Morton Soil Series:

The Morton soils is the dark grayish-brown loam soil that lies on the unglaciated upland areas. The five inch surface layer is dark brown friable loam or silt loam which normally contains more fine sand and fine sand loam than does the Williams. Below this layer and continuing to a depth of about sixteen inches the material is brown friable loam with prismatic structure. Morton loams are developed from the Fort Union geological formation. The surface of this soil is undulating to gently rolling and both surface and internal drainage is good. A large proportion of this soil is tilled and, as either crop or grazing land, the value of this soil is about eighty percent of that of the best soils in western South Dakota.

The Bainville Soil Series:

The Bainville loam is a light colored loam and the top five inch surface layer is light to grayish brown below which the color fades to brownish yellow. The material of this layer is friable, but has no well defined prismatic structure. The mass breaks into comparatively unaltered laminated gray and yellow silt and clay of the Fort Union geological formation. Carbonates sufficient to cause effervescence when the soil is treated with acid are within a few inches of the surface and white carbonate specks are numerous below a depth of ten inches. The surface of this soil is gently rolling to the steel phase. The native vegetation of this soil is blue grama, niggerwool, western wheatgrass and needle grass. The value of this soil is about sixty-five percent of that of the best soils west of South Dakota.

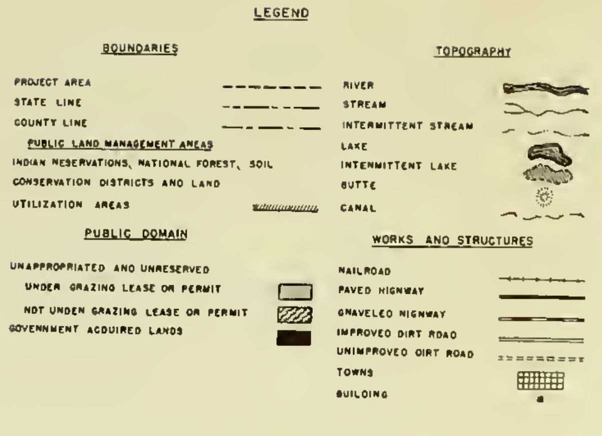
The Rhodes Loam Complex:

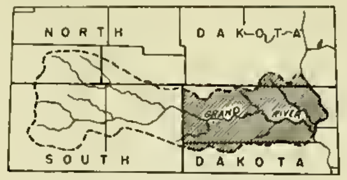
This soil complex occurs in the upland part of the area, largely in that part not covered by glacial till, and is within

the sub-group of the alkali, claypan and salty soils which have been markedly influenced by an excess of salts. These soils are characterized by a spotted landscape. The spots are irregular depressions which range from two to fifteen feet in diameter and lie from four to twelve inches below the inter-spot parts. The spots consist of comparatively intractable clay and generally support a very scant vegetation. The inter-spots are more variable and range in character from the alkali claypan soils (Rhodes Moline or Wade) to the zonal soils of the region (Williams, Morton and Baneville). The Rhodes soils are little used for crop production because of their spotted and alkali condition; however, they often produce a good crop of native forage vegetation and are, therefore, mainly used for grazing.

The Flasher fine sand soils:

Flasher soils are divided into fine, sandy loam; smooth, rolling and steep phase; and are characterized by a grayish brown fine sandy loam. The five inch surface soil is grayish-brown or dark grayish-brown crumbly fine sandy loam. Below this layer and continuing to a depth of about sixteen inches the material is brown and a little finer. Below a depth of twenty-two inches it is yellow or brownish yellow fine sand. This soil is very susceptible to wind blowing when unprotected by vegetation. The exposed areas often lose a large part of their surface soil and the lighter colored sub-soil is exposed. Because this soil is unable to retain moisture and dries out quickly, it supports a less desirable type of vegetation and will support only about forty to sixty percent as many cattle as the Morton or the Williams soils.





SKETCH MAP SHOWING LOCATION OF GRAND RIVER AREA IN NORTH DAKOTA - SOUTH DAKOTA

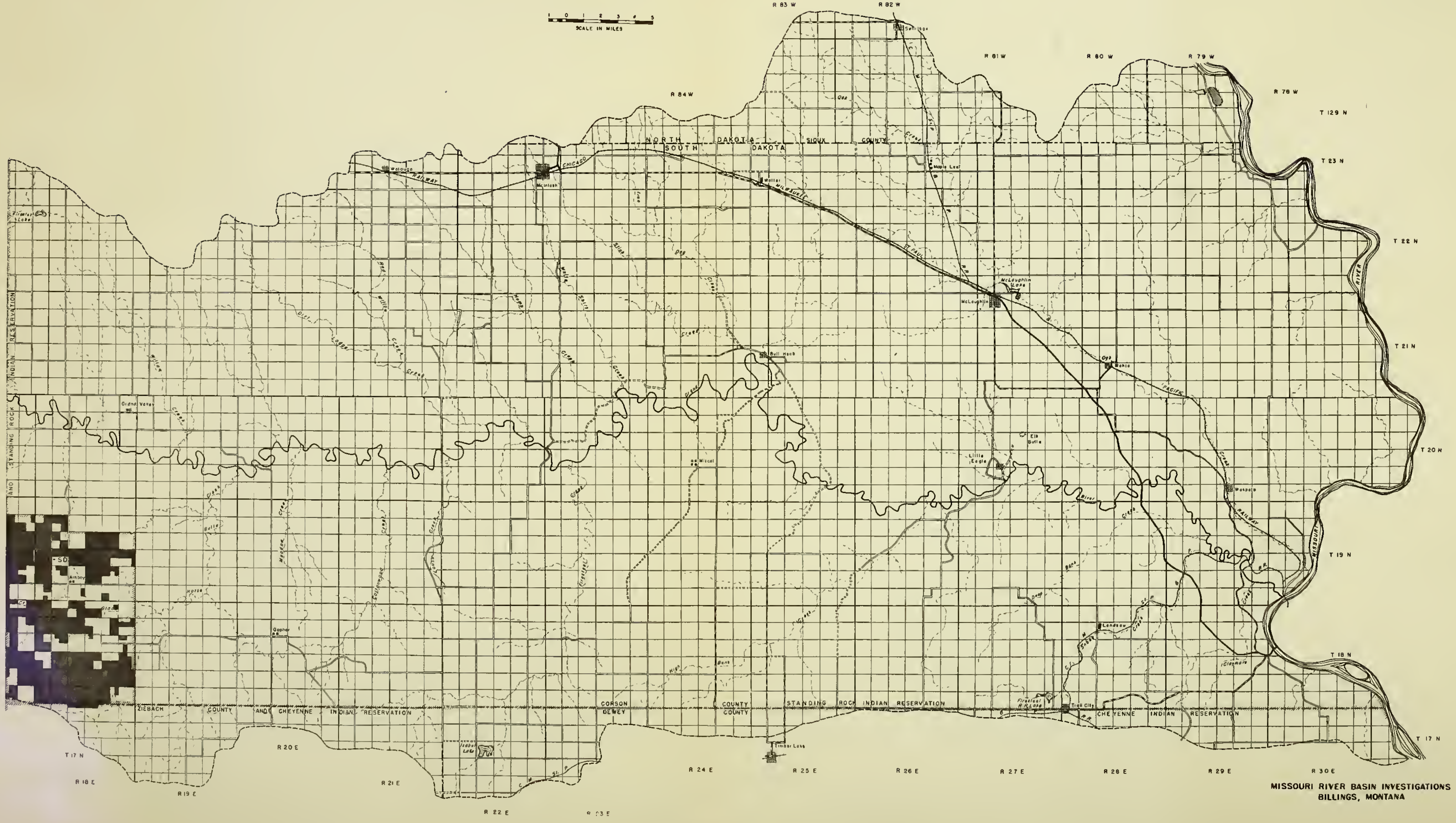
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
DIVISION OF LAND PLANNING

GRAND RIVER AREA

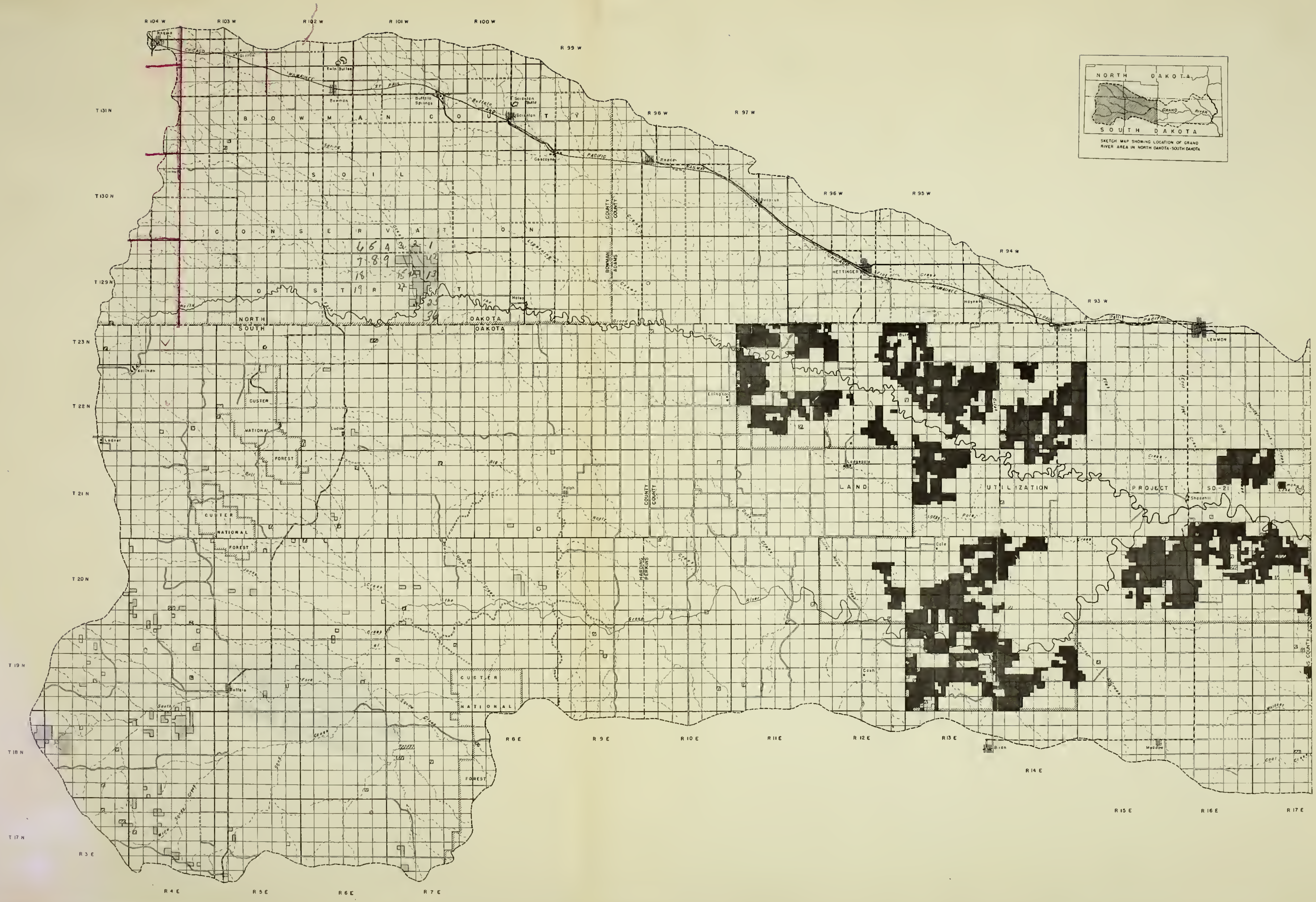
PUBLIC LANDS MAP

NORTH DAKOTA - SOUTH DAKOTA

BILLINGS DRAFTING OFFICE APRIL 1948



MISSOURI RIVER BASIN INVESTIGATIONS
BILLINGS, MONTANA

R 104 W
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Rhame
Griffin
Twin Buttes
Bowman
Buffalo Springs
Scranton Butte
Scranton
Gascoyne
Reeder
Bucyrus
Hettinger
Haynes
White Butte
Lemmon
Haley
BOWMAN COUNTY
ADAMS COUNTY
NORTH DAKOTA
SOUTH DAKOTA
North Grand River
Lightning Creek
Spring Creek
Flat Creek
Grand River
Kolihan
Ladner
Ludlow
Ralph
Ellingson
Lodgepole
Shadehill
Cole
Cash
Buffalo
Bison
Meadow
CUSTER NATIONAL FOREST
HARDING COUNTY
PERKINS COUNTY
L A N D U T I L I Z A T I O N P R O J E C T SD-21
South Fork Grand River
Bull Creek
Big Nasty Creek
Lodgepole Creek
Thunder Hawk Creek
Dog Creek
Flat Creek
Horse Creek
Jones Creek
Clarks Fork Creek
Crooked Creek
Coal Creek
Hay Creek
Antelope Creek
Moreau Creek
Rabbit Creek
Whitetail Creek
PERKINS COUNTY
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NORTH DAKOTA
SOUTH DAKOTA
GRAND RIVER
SKETCH MAP SHOWING LOCATION OF GRAND RIVER AREA IN NORTH DAKOTA - SOUTH DAKOTA

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